SECTION 7.0 – MITIGATION MEASURES

7.0 MITIGATION MEASURES

In the DEIR, two preferred alternative CAD cell site areas were proposed, CI and PIN (Maguire, 2002). Avoidance, minimization, and mitigation relative to these preferred alternatives were discussed specifically with regard to shellfish, finfish (DEIR, Appendix F), operations and management. Limitation of impacts by implementation of physical, biological, chemical and management techniques is implicit in the approach used to select the preferred alternative in this FEIR. Additional avoidance and minimization measures implicit in the EIR are summarized.

MEPA requires that the EIR identify "…*specific measures to be taken by the Proponent or any other Agency or Person to avoid, minimize, and mitigate potential environmental impacts; an Agency or Person responsible for funding and implementing mitigation measures, if not the Proponent; and the anticipated implementation schedule that shall ensure that mitigation measures shall be implemented prior to or when appropriate in relation to environmental impacts.*" In this section of the FEIR both non-compensatory avoidance and minimization measures and compensatory mitigation measures will be discussed. Avoidance and minimization measures included to arrive at the selected preferred alternative are non-compensatory. Measures not included in the selection process but proposed as mitigation for unavoidable more long-term impacts that require a form of replacement are compensatory.

7.1 Non-Compensatory Avoidance and Minimization Measures

Avoidance and minimization measures incorporated in the selection of the preferred alternative are limiting harmful impacts to the environment. These measures are summarized below.

- Dredging operations will be performed to assure that mixing of the unsuitable material and the suitable material is minimized. UDM will be placed in secure scows to minimize exposure to humans and the environment until the CAD cell(s) are completely excavated at which point the UDM will be safely placed in the bottom of the CAD for perpetuity.

- Sequestering the UDM in the PIN CAD cell will remove it from contact with the overlying water column, and replace it with clean material.

- Specific CAD sites and locations within the area of the preferred alternative will be determined by the specific dredging program developed by New Bedford and Fairhaven. This approach allows flexibility to satisfy users near-term maintenance dredging needs identified in the New Bedford Harbor Port Characterizations, thus, moderate volumes of UDM have a better chance to be removed from contact with the water column in the near future than would otherwise be the case (Maguire, 2002).

- Monitoring of the water column chemistry during CAD cell construction and related dredging projects will measure impact to water quality against thresholds defined by regulators. Avoidance and minimization measures will be taken if threshold exceedences are identified by water quality monitoring.

- Installation of floating semi-permeable turbidity barriers, if determined necessary and feasible, will limit distribution of particulates and minimize turbidity exceedences.

- Information provided on tides, currents, and winds by the detailed CAD cell dredging disposal event modeling can be applied to operational schedules to minimize impacts to water quality. The SSFATE and BF MASS model showed that for any environmental condition the smallest sediment plume and instantaneous chemical release occurred during northwest winds. Northwest winds are prevalent in the fall and winter (ASA, 2003, and see section 5.0)

- Long-term disruption of benthic communities at PIN CAD cell site area will be avoided through site management. Once caps are placed there will be no further disruption of that area. Benthic infauna at the PIN CAD cell site was confirmed to be predominantly opportunistic and pioneering species. Species are expected to recolonize the PIN CAD cells after capping.

- An analysis of the finfish community within New Bedford Harbor shows that imposition of a biological time-of-year dredged material disposal window at the selected preferred alternative can avoid and minimize harmful impacts to finfish known to inhabit the vicinity of the Inner Harbor inclusive of the PIN CAD cell. A detailed discussion of finfish life stages in relation to time-of-year dredged material disposal recommendations are presented below.

7.1.1 Finfish Community Impacted by the Selected Preferred Alternative

An analysis of the finfish community within New Bedford Harbor was conducted to determine when an appropriate open dredging window should occur (i.e., when dredging and dredged material disposal should be allowed). A closed dredging window (i.e., a period when dredging is minimized or avoided) will be established during seasonal peak occurrences of important species, effectively minimizing negative impacts, such as excess turbidity, to these fisheries resources and the harbor ecosystem. An open dredging window (i.e., a period when dredging is maximized) occupies the time-of-year when important species are least present. Important species are those finfish managed by fisheries agencies and non-managed species, all of which are important to the Harbor marine ecosystem. Even though commercial and recreational fishing is closed due to excess contamination within the Inner Harbor, it is important to consider the valuable role of finfish in the Harbor ecosystem at various life stages.

The fisheries resources survey for New Bedford conducted by Normandeau Associates, Inc. (NAI, 1999) in association with the Dredged Material Management Plan was used as the primary reference to determine the seasonal occurrences of fisheries resources within New Bedford Harbor. Additional sources were referenced to augment the primary reference and included the following:

- The Ecology of Buzzards Bay: An Estuarine Profile (Howes and Goehringer, 1996). This source includes specific references to seasonal occurrences of anadromous fish runs within the Acushnet River and other major drainages of Buzzards Bay;

- The First Year in the Life of Estuarine Fishes in the Middle Atlantic Bight (Able and Fahay, 1998). Buzzards Bay is included within the study area of this reference;

- Fishes of the Gulf of Maine (Bigelow and Schroeder, 1953). This source includes numerous references to species occurrences within Buzzards Bay;

- Various EFH Source Documents: National Marine Fisheries Publications (1999) prepared by various authors for each EFH-designated (i.e., "managed") species. These documents include a review of the available literature of the region with numerous references to studies conducted in the northeast, New England, and many times specifically within Buzzards Bay waters and estuaries;

- Buzzards Bay Disposal Site Report; Competing Site Use Assessment (Colburn et al., 2002). This report summarizes recreational fishing in Buzzards Bay; and

- Buzzards Bay Disposal Site Fisheries Trawl Survey Report. March 2001 – March 2002 (Camisa and Wilbur, 2002).

The NAI study included sampling conducted twice per month in New Bedford Harbor from June through October 1998 and May 1999 and once per month in November 1998 through April 1999 at three seine and five trawl stations. The results of the NAI study revealed that the species of finfish identified within the finfish community of the New Bedford Harbor was similar in composition to other estuaries of the northeast. A total of twenty-two species were identified among the three seine sample stations (representing the near shore communities). This total included the following managed species: black sea bass (*Centropristus striata*), bluefish (*Pomatomus saltatrix*), hake sp. (*Urophycis* sp.), scup (*Stenotomus chrysops*), and winter flounder (*Pseudopleuronectes americanus*). Atlantic silverside (*Menidia menidia*), cunner (*Tautogolabrus adspersus*), mummichog (*Fundulus heteroclitus*), striped killifish (*Fundulus majalis*), and winter flounder dominated the seine catch for the three seine stations. Thirty-six fish species were captured in the trawl samples among all stations combined. This total included 8 managed species: Atlantic sea herring (*Clupea harengus*), black sea bass, butterfish (*Peprilus triacanthus*), red hake (*Urophycis chuss*), scup, summer flounder (*Paralichthys dentatus*), windowpane (*Scophthalmus aquosus*), and winter flounder. Black sea bass, cunner, northern pipefish (*Syngnathus fuscus*), scup, and winter flounder dominated the catch for the five trawl sample stations (representing the deeper water community).

The recruitment patterns of abundant fish species with economic and recreational value (scup, cunner, black sea bass, and winter flounder) in New Bedford Harbor were consistent with the published spawning and recruitment seasons for these species in the region. For instance, scup are known to spawn in early May through mid-July (Bigelow and Schroeder, 1953; Steimle et al 1999b) with young of year (YOY) recruiting to inshore waters in early summer, remaining there through September (Able and Fahay, 1998). While summering inshore, in water depths between 6 and 120 feet, scup stay close to shore in schools (Bigelow and Schroeder, 1953). They prefer smooth to rocky bottom (Bigelow and Schroeder, 1953). Scup were apparent in the NT5 trawl in September, while no particular size class was mentioned samples were expected to be the similar larval stage in size class to those of the NT4 trawls. The NAI study found that cunners were recruited from July through November, which is indicative of an extended spawning season, and consistent with that reported by Wheatland (1956). Black sea bass are known to spawn in deeper waters offshore during summer months. They prefer depths of 18-45 m. When these bass reach 13-24 mm total length (TL) they become demersal and enter estuarine nursery grounds. This is consistent with the findings of the NAI study (NAI, 1999).

The finfish communities and habitat of the deeper-water (i.e., trawl) stations in New Bedford Harbor were very similar among all trawl stations except Station NT5, the station located farthest upriver within the Inner Harbor and proximal to the preferred alternative CAD cell site area at Pope's Island North (PIN). This station represents the finfish community expected to occur proximal to the PIN CAD cell site area. Station NT5 had a shallower depth (2-3 m) in comparison to the other trawl stations throughout the harbor, which ranged from 5 to 9m deep. The NAI study notes some presence of shells and gravel over sand and silt in their substrate description of sampling station NT5. There may have been patches of gravel and shell, but it is expected that the coarse material recognized in the trawl sample was not uniformly distributed at the trawl station (NAI, 1999). The surficial vibracores and grab sample programs for PIN showed predominant percentages of silt and clay in samples (Maguire, 2003; ENSR, 2003). The comparison of the percent contribution (by geometric mean catch-per-unit-effort) among the top five most abundant species and all remaining species captured at NT5 were as follows: winter flounder (52.5%) seaboard goby (*Gobiosoma ginsburgi*)(9.5%), Atlantic silverside (8.1%), bay anchovy (*Anchoa mitchilli*) (6.5%), windowpane (5.7%), and all other (eleven) species combined (17.8%) (NAI, 1999).

Due to their demersal egg, larvae, juvenile, and adult life stages, winter flounder are especially susceptible to dredging-induced, and dredged material disposal-induced turbidity. This managed species was present in trawl NT5 captures every month except July, with peak abundances occurring from October through December. Suitable spawning conditions occur when water temperatures drop below 10^{o}C, which was determined to occur during the study as early as November. Larvae are reported to be abundant in Buzzards Bay waters from March through June. Young winter flounder are reported to remain within embayments their first year, move out into more open waters during summer months, then return to spawning areas in late fall (Howes and Goehringer, 1996). Recruitment of YOY (<100mm TL) was noted within the Inner Harbor in November. At this time, juveniles (100-200 mm TL) were more common at NT5 than at any other station, indicating that the Inner Harbor provides an important nursery for winter flounder. There was little evidence of YOY winter flounder recruitment during other months (NAI, 1999).

Diadromous fish were also collected within New Bedford Harbor during the NAI study. American eel (*Anguilla rostrata*), a catadromous species, was collected from one trawl sampling location in November. Anadromous fish run the Acushnet River in high abundance early in the year to spawn at upstream locations. Spring runs in the Acushnet River range between January and March with the peak of the run in February and March (Jim Turek, personal communication, 2003). Juveniles come down stream as early as August peaking in September and continuing to run to October (Jim Turek, personal communication, 2003) in the Acushnet. Alewife (*Alosa pseudoharengus*), rainbow smelt (*Osmerus mordax*), blueback herring (*Alosa aestivalis*), striped bass (*Morone saxatilis*) and white perch (*Morone americana*) are anadromous fish species that were caught in trawl samples within New Bedford Harbor. Rainbow smelt are the first anadromous fish to migrate up tidal streams to brackish and freshwater systems for spawning. They begin their upstream spawning runs as early as February and continue into April. Alewives begin spawning migrations to freshwater ponds in late April to early May, depending on water temperature (Howes and Goehringer, 1996). The larvae stay within the spawning ponds only briefly, migrating out to the estuaries beginning in July and continuing through the fall. Likewise, blueback herring enter estuaries in mid-May to begin their spawning runs upriver. They are common throughout Buzzards Bay in later summer and fall. Although they are not managed species, they provide an important food source to bluefish and striped bass (Howes and Goehringer, 1996), and are the target of recent restoration efforts within the area (J. Turek, personal communication). Striped bass (*Morone saxatilis)* occurs within New Bedford Harbor from July through October. A summary of diadromous fish species, life stages, seasonal occurrence and presence confirmed within New Bedford Harbor is provided in Table 7-1.

Table 7-1. Diadromous fish species, life stages, seasonal occurrence and presence confirmed by the Normandeau trawl survey within New Bedford Harbor.

Species	Life Stages	Seasonal Occurrence	Presence Confirmed in New Bedford Harbor
American eel	A, J	November (NAI, 1999)	Lower Reach of Inner Harbor (NAI, 1999)
Alewife	A, J	Upstream: April - early May Downstream: Fall (Howes and Goehringer, 1996)	Captured in Outer Harbor in September (NAI, 1999)
Rainbow smelt	A, J	February through April.	Outer Harbor and Lower Reach of Inner Harbor (NAI, 1999)
Blueback herring	A, J	mid-May (Howes and Goehringer, 1996)	Reported in NAI (1999) comp. list of spp. captured in trawls, but does not appear within any station-specific lists
Striped bass	A	July, October (NAI, 1999)	Upper and Lower Reaches of Inner Harbor (NAI, 1999)
White perch	A, J	March (NAI, 1999)	Lower Reach of Inner Harbor (NAI, 1999)

A = Adults J= Juveniles

Highly migratory gamefish, such as blue fish and weakfish are expected to frequent the Harbor and Acushnet River estuary in pursuit of their favored prey during the summer. Favored prey includes herring, mackerel, butterfish, anchovies, scup, flatfishes, etc. (Bowman, 2000).

Natural sedimentation is expected to replicate existing seafloor habitat over constructed CAD cell caps (See ENSR, 2001 for Boston Harbor example); artificial habitat mitigation is therefore not proposed.

7.1.2 Biological Time-of-Year Dredged Material Disposal Windows for the Selected Preferred Alternative

The results of the NAI study identified the species and seasonal occurrences of both anadromous and EFH-designated (i.e., “managed”) finfish species within the harbor (Figures 7-1 and 7-2). Based on the results of the seasonal occurrences of these finfish resources, appropriate biological time-of-year open dredging and dredged material disposal windows can be developed, in concert with a specific project proposal, based on the DMF recommendations.

7.2 Compensatory Mitigation Measures

Comments on the DEIR from the representative of the MA DMF indicated that compensatory mitigation through propagation should be provided for impacts on shellfish species at the disposal site on a project-by-project basis with assistance from a specific MA DMF shellfish biologist. Northern quahogs, *(Mercenaria mercenaria)* and soft-shell clams *(Mya arenaria)* are the two important sedentary shellfish species that will be negatively impacted by PIN CAD cell construction (MA DMF). A brief descriptive summary of these two indigenous shellfish populations and the proposed compensatory replacement mitigation is provided below.

7.2.1 Economically Important Sedentary Shellfish at the PIN CAD Cell Site Area

Research that supported preparation of the DEIR did not include benthic invertebrate sampling of the two economically important species of sedentary shellfish; northern quahogs and soft-shelled clams. However, previous DMF studies in the region contained some information on the abundance of these shellfish in the PIN CAD cell area of New Bedford Harbor (Whittaker, 1999). MA DMF sampled the New Bedford Harbor and Acushnet River estuary complex in order to identify important shellfish resource areas. In the same 1999 DMF report, sampling areas for shellfish that overlap the PIN CAD cell area showed a significant percentage (i.e., greater than 30%) of the cherrystone size class of the quahog, and a significant percentage (i.e., greater than 20%) of the littleneck size-class of the quahog The soft-shell clam was also found to be abundant at this location. The number of bushels of specific size-class quahogs per acre was calculated using an area-density method. The average number of cherrystones per acre for two sampling areas overlapping the PIN CAD cell area ranged from roughly 150 in the northern area west of Marsh Island to 450 south of Marsh Island in the direction of Popes Island (Whittaker, 1999). In the sampling area west of Marsh Island, nearly one bushel of soft-shell clams, evidently high-density, was retrieved on two sampling tows. However, all of New Bedford/Fairhaven Harbor waters north of the hurricane barrier are closed to shellfishing (DMF, 1999).

When interviewed for this section of the FEIR, DMF supported the finding of the 1999 study that the filter feeding sedentary bivalve mollusks, quahogs and clams, of the PIN CAD cell area were contaminated with PCBs to the extent that they were unfit to be purified for human consumption (Whittaker personal communication, 2003). The American oyster *(Crassostrea virginica),* also filter feeding sedentary bivalve mollusks, were collected for toxicity analysis from the area west of Marsh Island that overlapped the PIN CAD cell for the 1999 DMF survey. The 1999 American oyster sample was reported to have of 3.60 ppm. PCBs. This level of PCBs exceeded the 2.0 ppm. PCBs threshold for human consumption. MA DMF stated that any of the important northern quahogs or soft-shelled clams negatively impacted by PIN CAD cell construction dredging will be lost (Whittaker personal communication, 2003).

The DEIR noted that the quahogs and soft-shell clams that would be lost in construction of PIN CAD cell(s) are important to the estuarine harbor ecosystem through reproduction potential as prey for other organisms and water filtering capacity. DMF will require compensatory replacement of the lost shellfish. The construction proponent(s) may be required to replace a specific quantity of quahogs and clams as a project permit condition. DMF will mathematically formulate the loss of these shellfish per acre of impact due to PIN CAD cell construction as a service for potential proponent(s) on a project-by-project basis in cooperation with local municipal shellfish constables.

New Bedford and Fairhaven operate shellfish management jurisdictions under the direction of municipal shellfish constables. Local municipal shellfish management will apply the best management practice for restocking mitigated quahogs and clams in their respective jurisdictions. The schedule for restocking will be determined by local shellfish constables. Restocking mitigated quahogs and clams will enhance the harbor shellfish populations and offset negative impacts to the established shellfish populations and surrounding estuarine harbor ecosystem.

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Figure 7-1. Diadromous Fish Species of New Bedford Harbor and Adjacent Buzzards Bay - Seasonal Occurrence of Life Stages Most Susceptible to Dredged Sediment Disposal Activities

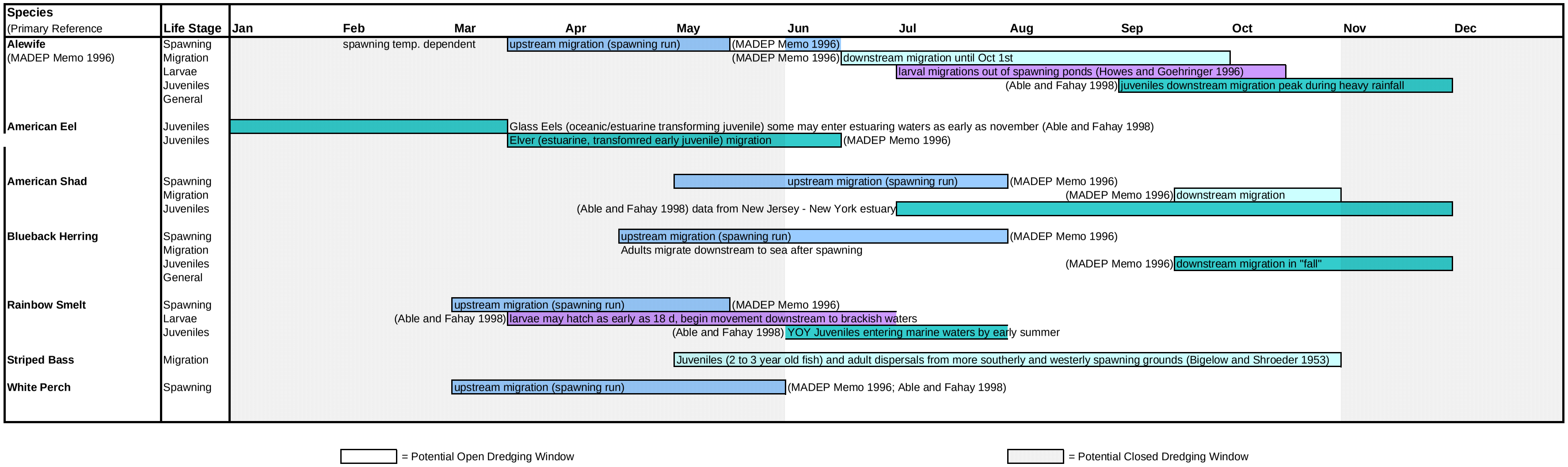

Figure7-2. Seasonal Occurrences of EFH Species Confirmed within the Vicinity of New Bedford Harbor (NAI, 1999) and Vicinity (Other References)